



Minuteman Effectiveness Transformation: Optimizing the Implementation



Daniel C. Hendrickson
The Boeing Company

1Lt. Amanda F. Vaughn
ICBM SPO, USAF

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Why Transform?

- **There is uncertainty in the new world environment**
 - **Adversaries/targets/costs**
- **Transforming ICBMs by using GPS technology addresses these uncertainties**
 - **Strategic deterrence with fewer missiles/RVs**
 - Additional targets may be addressed
 - Ability to eliminate fixed/relocatable/hidden targets
 - Anywhere in the world
 - At a moments notice

**Assured Strategic Deterrence with
Significant Increase in Operational
Flexibility**



Key Question

- **These new capabilities for Minuteman will result in a non-traditional mix of guidance and re-entry systems.**
- **Will a model that determines the most cost effective force mix be useful?**



Optimization Problem

- **Model Inputs**

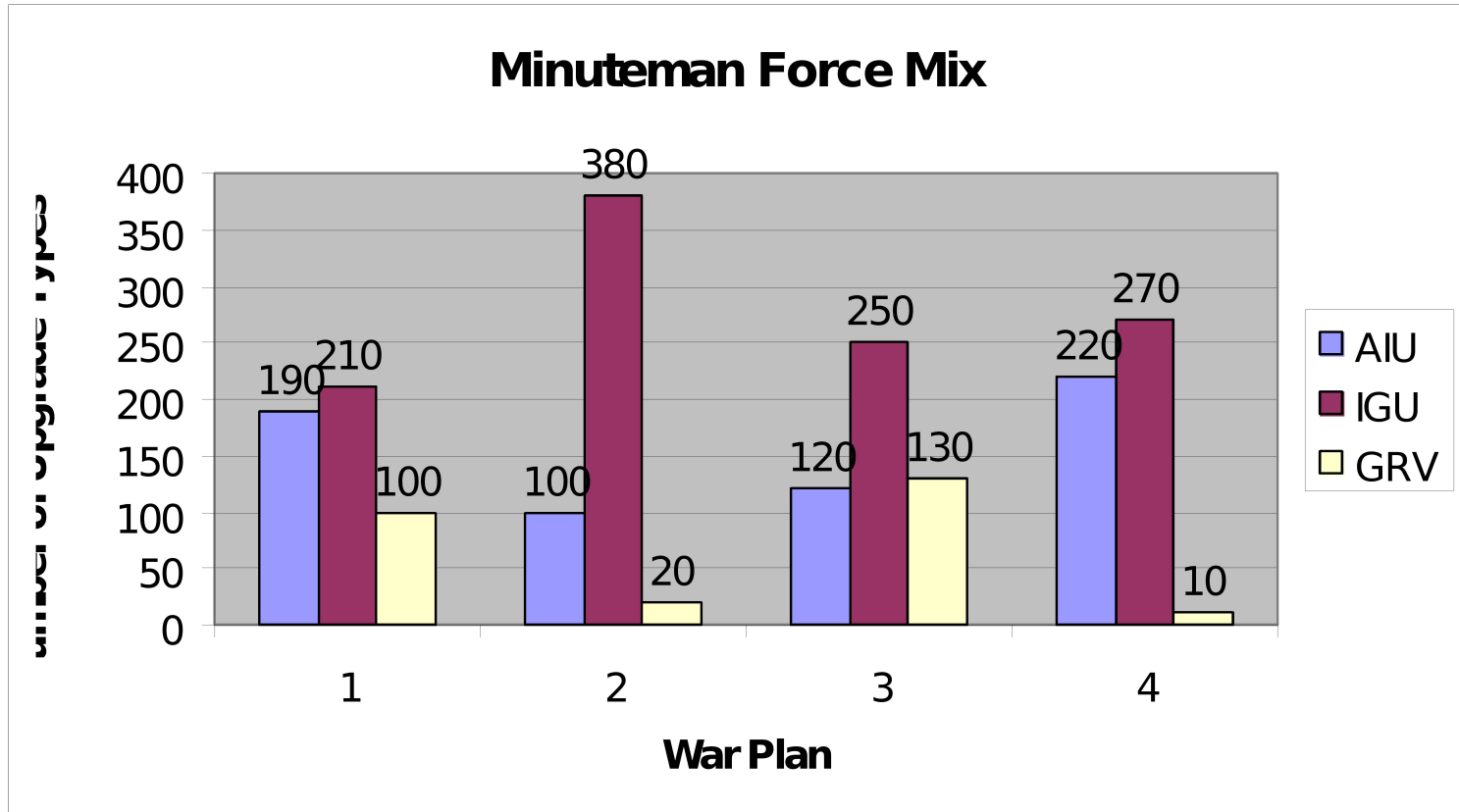
- **500 missiles**
 - Assume 1 RV per missile
- **4 possible accuracies**
 - Baseline, AIU, IGU or GRV
 - Corresponding cost and accuracy improvements
 - Risk added as cost
- **3 possible yields**
- **Target characteristics**
 - Hardness

- **Model Constraints**

- **$P_k > 90\%$**
 - Include the reliability and survivability of each upgrade type
- **Minimum Cost for total force structure**



Output of Model is Force Mix



Any War Plan optimized for minimum cost



Follow-On Steps

- **Sensitivity analysis**
 - **How does the solution change for a different war scenario? How robust is the solution for the force mix?**
- **Real-world limitations**
 - **Include treaty limitations on number of RVs, antennae etc.**
- **Expand the scope**
 - **Open the model to include non-Minuteman specific scenarios - boost upgrades, relocatable targets, non-nuclear weapons etc.**

